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Comprehensive kinetic and structural studies shed a new light on the mechanisms of inhibition by which flavonoid derivatives inhibit tyrosinase activity

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ABSTRACT

The inhibitory effects of four flavonoids on the diphenolase activity of mushroom tyrosinase were investigated using spectroscopic approaches. Analysis of our kinetic data demonstrated that flavonoids led to a reversible inhibition on the enzyme activity. Further study showed that gallic acid acted as noncompetitive inhibitor, whereas chrysin, naringin and quercetin inhibited the enzyme activity in a competitive fashion. Comparison of the inhibition constants revealed that the strength with which the inhibitors restricted the enzyme activity was ranking as follows: chrysin (Ki: 7.9 mM) < quercetin (Ki: 7.44 mM) < naringin (Ki: 3.04 mM) < gallic acid (Ki: 1.5 mM). These data, therefore, suggest that gallic acid is the most potent inhibitor compared to the other flavonoids used. In line with the kinetic data, our structural analysis showed that these natural inhibitors exerted their inhibitory effects by changing the overall structure of the enzyme. Taken together, our data clearly demonstrated that the applied flavonoids played inhibitory effects on the mushroom tyrosinase enzyme activity.

Key words: Inhibition; Kinetics; Structure; Mushroom Tyrosinase